

TECHNICAL MEMORANDUM

CH2MHILL

Addendum: Bunker Hill Mine Water Treatability Study Work Plan

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Introduction

This technical memorandum presents updated procedures to be used during the Bunker Hill Mine Water Treatability Study, being conducted as part of EPA's Presumptive Remedy process. This information updates that presented in the approved Bunker Hill Mine Water Treatability Study Work Plan prepared by CH2M HILL, dated July 1999. This addendum references the approved work plan by section number where there are changes.

Rationale for this Addendum

This addendum is required because initial characterization of the 30 gallons of central treatment plant (CTP) effluent to be used for treatability testing, as described in Section 3.1 of the work plan, found much lower concentrations of dissolved cadmium, lead, and zinc than expected. The following dissolved concentrations were found for field samples collected from the drum (data is preliminary and has not been validated).

Bunker Hill Effluent Sample Characterization Data [PRELIMINARY]				
Sample ID =>		BH-EFF0-081699	BH-EFFA-081699	BH-EFF1-082399
Sample Description =>		CTP Effluent (field)	CTP Effluent (field dup)	Treatment Goal (70:10)
Parameter	Units			
ICP/Zn) or GF/AAs (Cd/Pb) Data				
Dissolved				
Cd	µg/L	0.24 B	0.25 B	0.157
Pb	µg/L	0.46 U	0.46 U	0.48
Zn	µg/L	2.1 B	1.4 U	11.5
ICP/MS Data				
Dissolved				
Cd	µg/L	0.32	Not Tested	0.157
Pb	µg/L	0.04 U	Not Tested	0.48
Zn	µg/L	12.2	Not Tested	11.5
B = Reported value is between instrument detection limit (IDL) and contract required detection limit (CRDL). U = Not detected above the IDL				

As can be seen in the above table, the concentration of dissolved metals was found to be either below or slightly above the 7Q10 treatment goal and either below or near the analytical detection limits. Higher dissolved concentrations were expected based on the findings of the 1997 CTP HDS trial, as shown in Table 3-4 of the December 1997 report, which shows dissolved cadmium concentrations between <1 and 60 µg/L, dissolved lead concentrations between <10 and 60 µg/L, and dissolved zinc typically between 4 and 300 µg/L. Table 3-4 of the trial report also shows that pH varied between 6.7 and 8.9, and that in general concentrations decreased as pH increased, especially for cadmium.

Major objectives of the treatability study are to compare dissolved metal concentrations achievable by sulfide precipitation, iron co-precipitation, and ion exchange, and to provide preliminary process optimization. Because the initial concentrations in the test water are so low and near or below the analytical detection limits, it would be difficult to discern real differences in technology performance and to perform preliminary process optimization. For this reason the following two courses of action will be conducted:

- The test water will be spiked to increase the dissolved cadmium, lead, and zinc concentrations. The target after-spike concentrations are 20 µg/L for cadmium, 20 µg/L for lead, and 100 µg/L for zinc. After spiking the treatability testing will be conducted per the approved work plan.
- The CTP effluent will be sampled twice per week for an estimated three months and tested for pH in the field and by ICP/MS for dissolved cadmium, lead, and zinc. This will provide longer-term information on the capability of the existing CTP to remove these dissolved metals, and will provide better understanding of the relationship between pH and metal removal.

Procedures for Spiking

Wastewater spiking will be performed on batches of CTP effluent sized to allow each treatability test series to be conducted from a single batch. A spiking stock solution was prepared using cadmium sulfate ($\text{CdSO}_4 \cdot 8/3\text{H}_2\text{O}$), zinc sulfate ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$), and a lead atomic absorption spectrometry (AA) standard obtained commercially (Pb in dilute HNO_3), to produce target dissolved concentrations of 40 µg/mL cadmium, 40 µg/mL lead, and 200 µg/mL zinc. The AA standard was used for lead because of solubility limitations for lead sulfate. This stock solution will be used to prepare each batch of spiked wastewater by adding 0.5 mL of the spiking stock solution for each liter of CTP effluent to be spiked. The intent is to create target dissolved concentrations in the spiked CTP effluent of approximately 20 µg/L cadmium, 20 µg/L lead, and 100 µg/L zinc (added amounts). Each batch of spiked wastewater will be analyzed along with each series of treatability test samples to confirm the dissolved metals concentrations before treatment.

Procedures for CTP Effluent Sampling

The procedures to be used for the CTP effluent samples are the same as described in the approved work plan for CTP effluent with the following exceptions. The following section numbers refer to the approved work plan.

Sampling (Section 4.1)

CTP thickener overflow samples will be collected twice per week from the discharge point into the polishing pond. The sample will be a 1-liter grab sample collected from the discharge into the polishing pond. The sample will be prepared and used per Table 4-1, except only field pH and dissolved cadmium, lead, and zinc analyses will be conducted. The samples for dissolved metals will be shipped weekly to CAS labs, in Kelso, WA, for analysis using EPA Method 6020 (ICP/MS). The required turn-around time for data is two weeks.

Field Quality Control Samples (Section 4.4)

Field duplicate, field blank, and laboratory QC samples will be collected at a minimum frequency of 10 percent (1 in 10).

Sample Designations (Section 4.9)

The sample designation will be EFFdate. For example, a sample collected on September 13, 1999, would be designated EFF091399. For QC samples, either a D, a B, or L will be inserted after EFF, referring to field duplicate, field blank, or laboratory QC respectively. For example, a field blank collected on September 13, 1999, would be designated EFFB091399.